**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Materials and Equipment**

* water
* at least 12 identically sized strips of paper (4 for each pen)  
  Note: chromatography paper or laboratory filter paper is preferable, but you can use a paper towel. The problem with paper towels is that they may be too absorptive and smear the ink.
* ruler
* pencils
* at least three different types of markers (including one permanent marker), or at least three different colors of marker (including one permanent marker)
* a wide-mouth jar for the solvent

**Experimental Procedure**

Note: To make sure you can compare your results, as many of your materials as possible should remain constant. This means that the temperature, type of water used, size of paper strips, where the ink is placed onto the paper etc. should **remain the same throughout the experiment**.

1. Cut paper strips about one x four inches in area (they must all be the same size).
2. Take one of the paper strips and use a ruler and pencil to draw a line across it horizontally **two cm** from the bottom. This is the origin line (see illustration, below).

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| Origin-Spot Diagram |

1. Pour a small amount of water into your glass (there should be barely enough for the paper strip to hang inside of the jar and just touch the water).
2. Using one of the markers, place a small dot of ink onto the line (see illustration, above).
3. Use the pencil to label the strip, so that you know which marker it represents.
4. Tape the paper to a pencil or the edge of the jar and hang it into the jar of solvent so that the bottom edge is just barely touching (see illustration, below).

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| Glass-Paper Example |

1. Let the water rise up the strip until it is almost at the top.
2. Remove the strip from the jar and **mark how far the solvent rose** with a pencil.
3. Analyze the ink component(s):  
   **Measure the distance the solvent and each ink component traveled** from the starting position, then **calculate the Rf value** for each component (some of the ink components might not have moved at all!).
4. Repeat this experiment for each brand or color of marker **four times.**

***Data Table***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Marker type and color*** | ***SOLVENT***  ***used*** | ***Strip 1***  ***Distance ink traveled and observations*** | ***Strip 2***  ***Distance ink traveled and observations*** | ***Strip 3***  ***Distance ink traveled and observations*** | ***Strip 4***  ***Distance ink traveled and observations*** |
|  |  |  |  |  |  |
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|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

***SELECT THE BEST GRAPH TO SHOW YOUR DATA AND CREATE THE GRAPH***

***Questions***

* Did the different inks separate differently? By looking at the Rf values, can you tell if any of the ink components from the different markers are the same?
* If the ink components separated differently for each marker, why did this happen (think about the strength of attractions)?
* How did the type of solvent affect the different marker solutions?